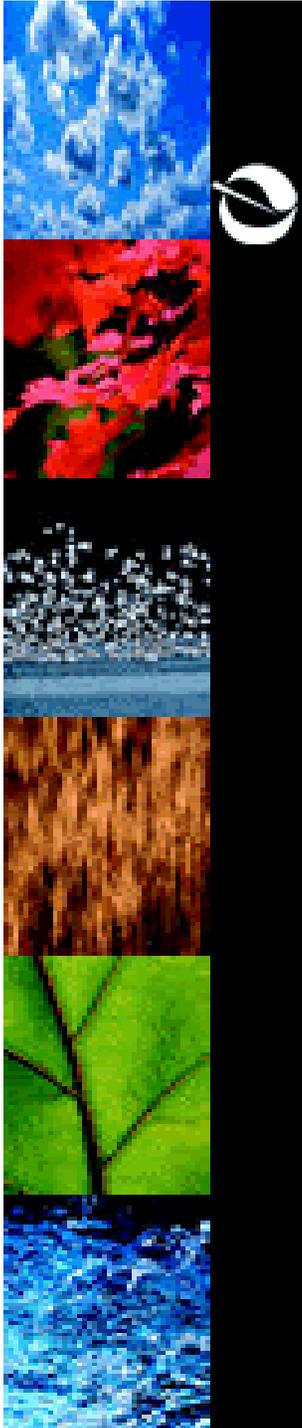


California Human Health Screening Levels:

Users Manual

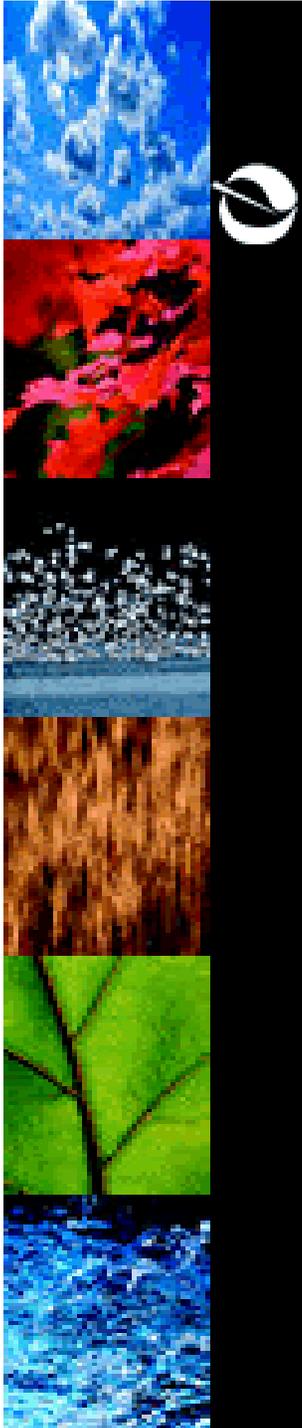
New Tools for Brownfields Reuse
April, 2005



Presentation Overview

- Introduction
- Principals of Risk Assessment
- Screening Level Basics
- CHHSL Basics & Use
- Limitations & Next Steps
- Questions and Comments

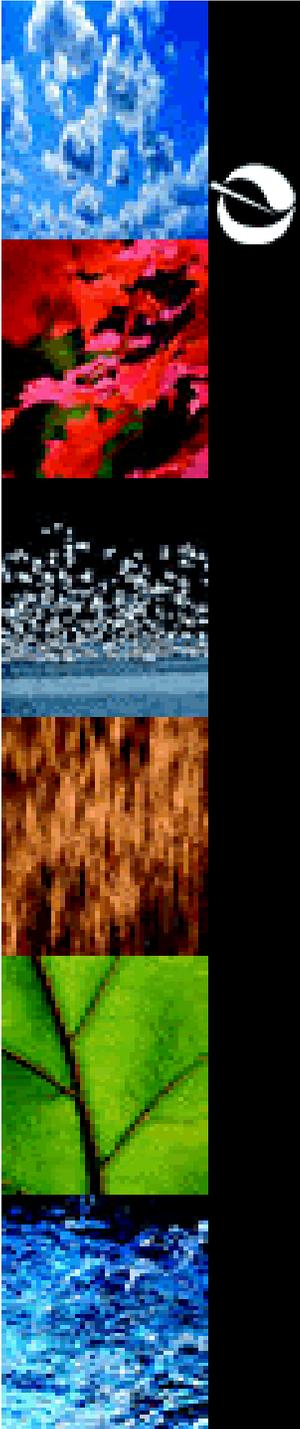




Legislative Background

- SB32 – California Land Environmental Restoration and Reuse Act
- CHHSLs developed by the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA)
- ”may be used ... to estimate the degree of effort that may be necessary to remediate a contaminated property”.

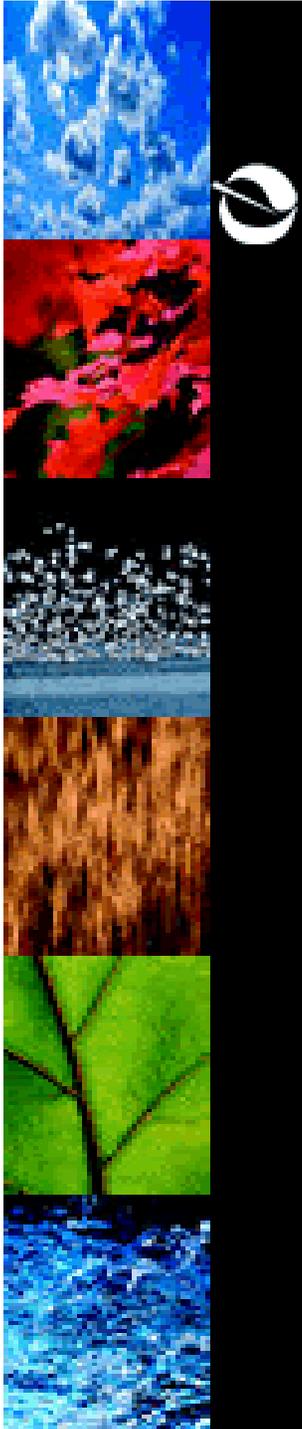




What are CHHSLs?

- Concentrations of 54 chemicals that the Cal/EPA has determined to be below thresholds of concern for risks to human health
- Non-regulatory and advisory in nature – use of CHHSLs is voluntary

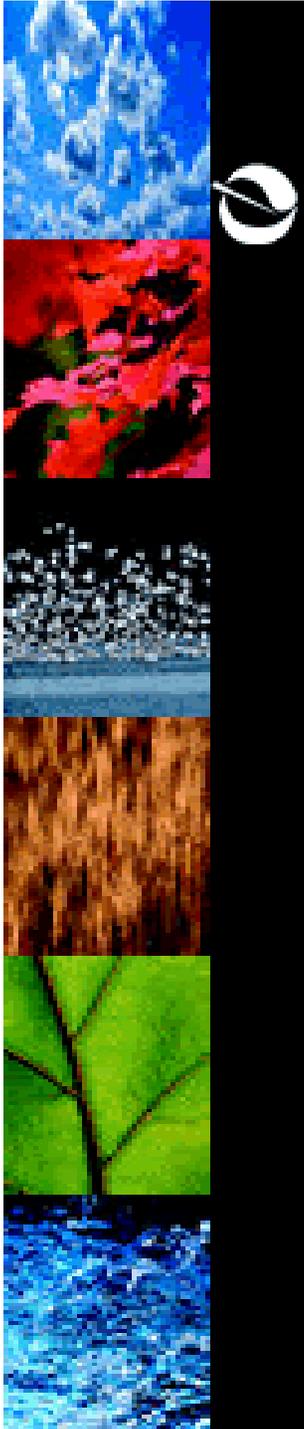




Developing CHSLs

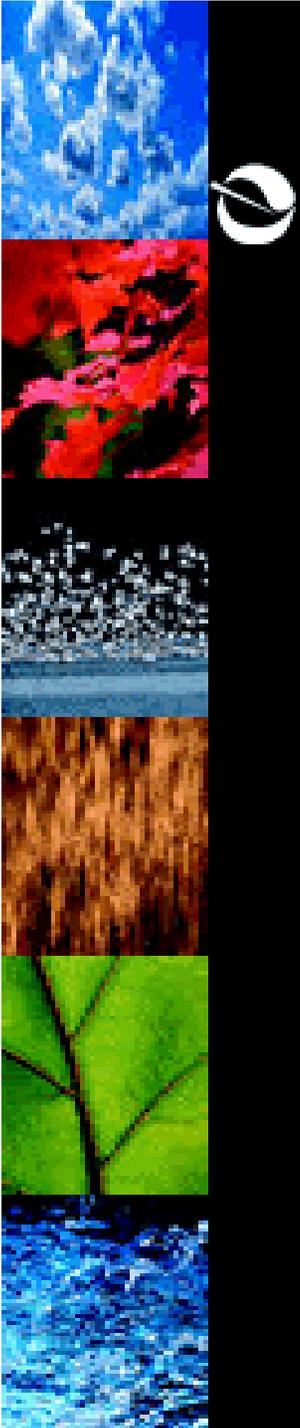
- Both residential and industrial scenarios considered
- Specific exposure pathways for non-volatile chemicals:
 - Soil ingestion
 - Dermal absorption
 - Inhalation of dusts
- Vapor intrusion into indoor air pathway for volatile chemicals





Principals of Risk Assessment





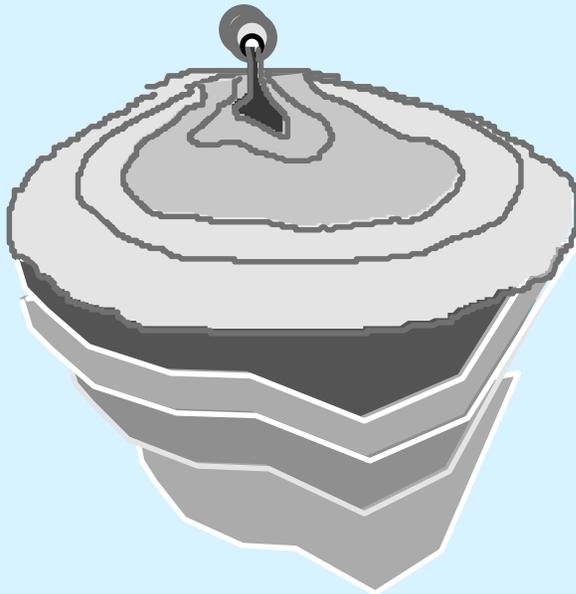
Health Risk Assessment

- Used to Make Regulatory Decisions
- Can Only Address Future Risk and Hazard
- Is Not a Substitute for Medical Advice



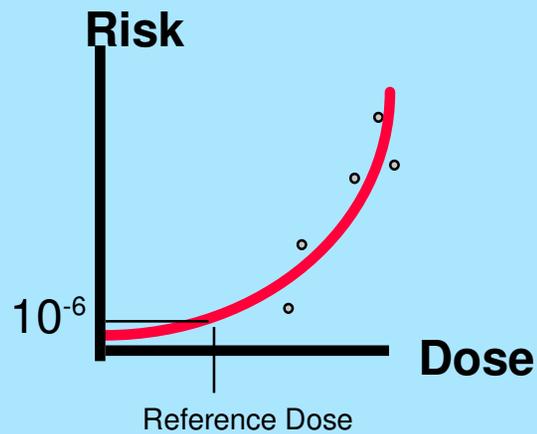
Risk Assessment: Simple Conceptual Components

Source Assessment



Hazard ID

Toxicity Assessment

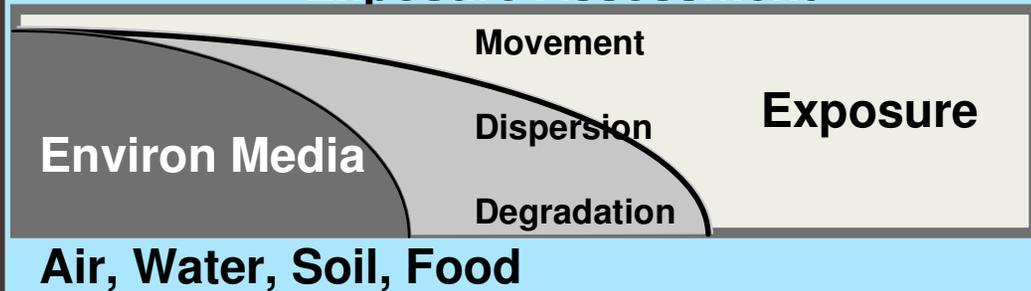


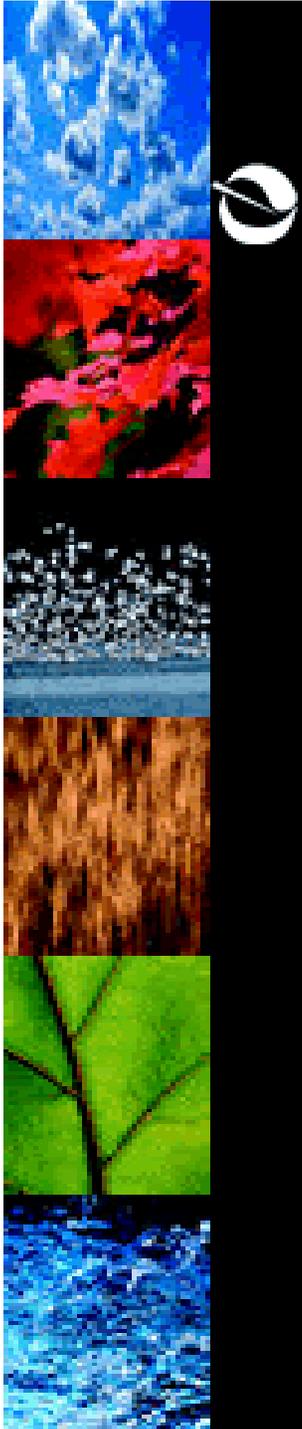
Risk Characterization

Calculated Risk

Acceptable Risk

Exposure Assessment

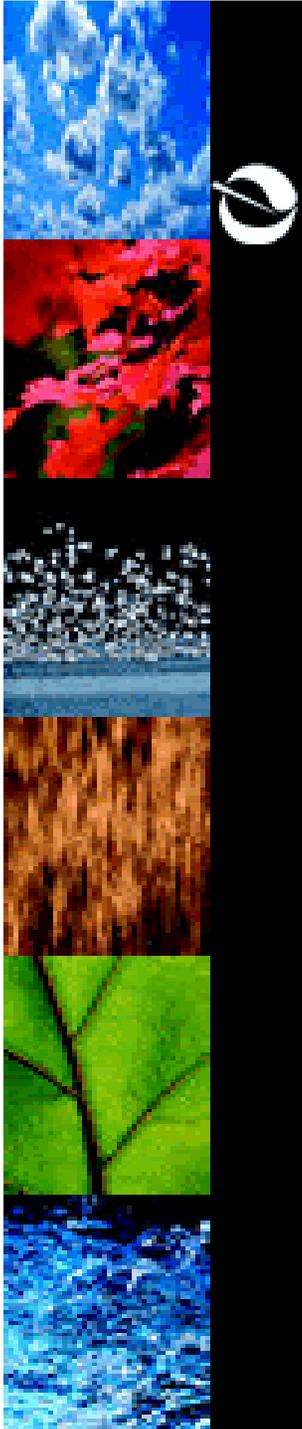




Source Assessment/Hazard Identification

- Identify areas of possible release
 - where is it?
- Identify chemicals of concern
 - what is it?
- Collect data
 - how much is present?

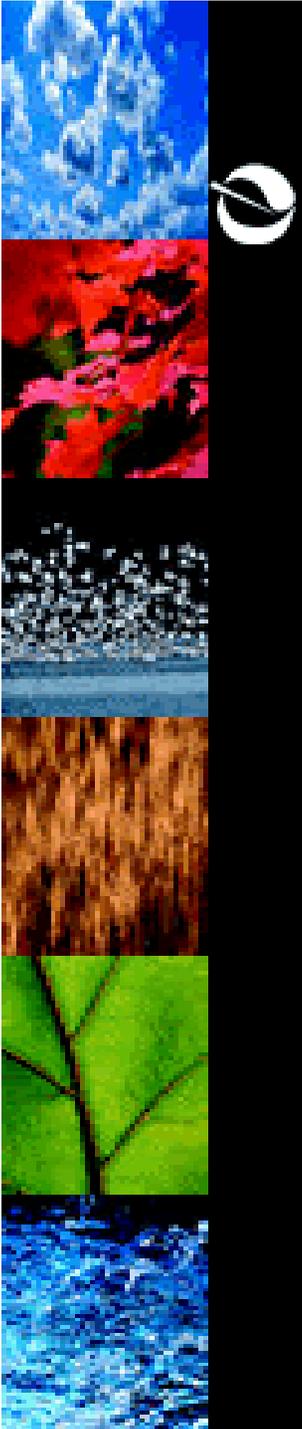




Toxicity Assessment

- Chemical dose response
 - What can it do to me?
- Chemical toxicity criteria values
 - How dangerous is it?
 - ★ Non-carcinogenic “reference doses”
 - ★ Carcinogenic “slope factors”

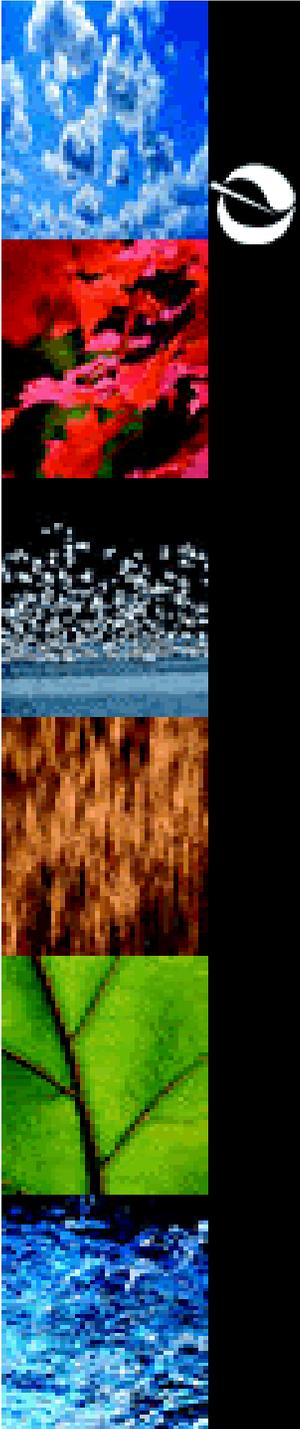




Exposure Assessment

- Land use scenarios
 - Residential (unrestricted)
 - Industrial/commercial
 - Sensitive subpopulations
- Exposure routes/pathways
 - How can it get inside me?
- Fate/transport mechanisms
 - How can it move to where I can be exposed?
- Dose calculations

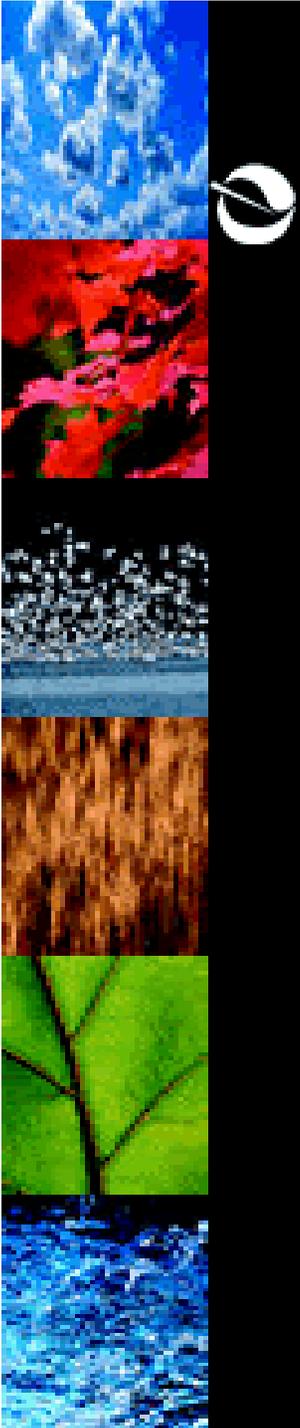




Risk Characterization

- Cancer Risk
 - What is the risk that I might get cancer from exposure to chemicals at the site?
 - Slope factor x dose
- Hazard Index
 - What is the hazard that I might otherwise get sick from exposure to chemicals at the site?
 - Dose/Reference Dose

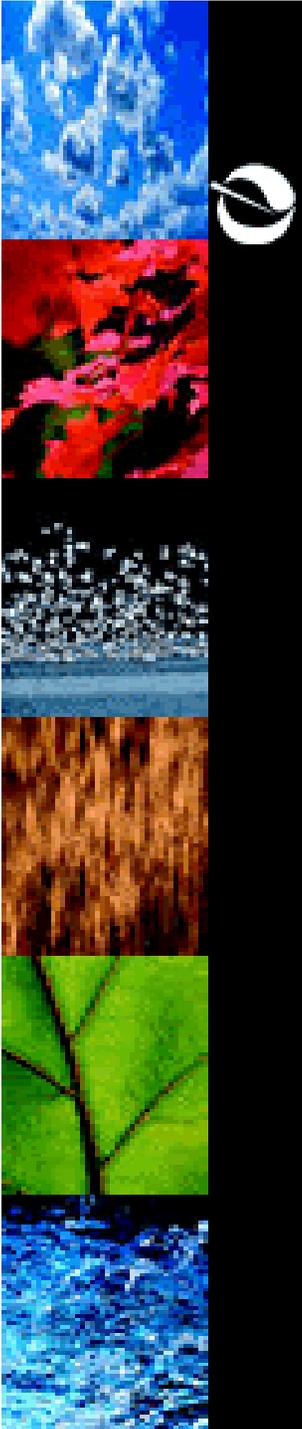




Uses of Risk Assessment

- Estimate risk if nothing is done to clean up the toxic chemicals released to the environment
- Estimate levels of chemicals that can be left at the site
 - US EPA Preliminary remediation goals (PRGs)
 - *California human health screening levels (CHHSLs)*
- Evaluate possible cleanup solutions



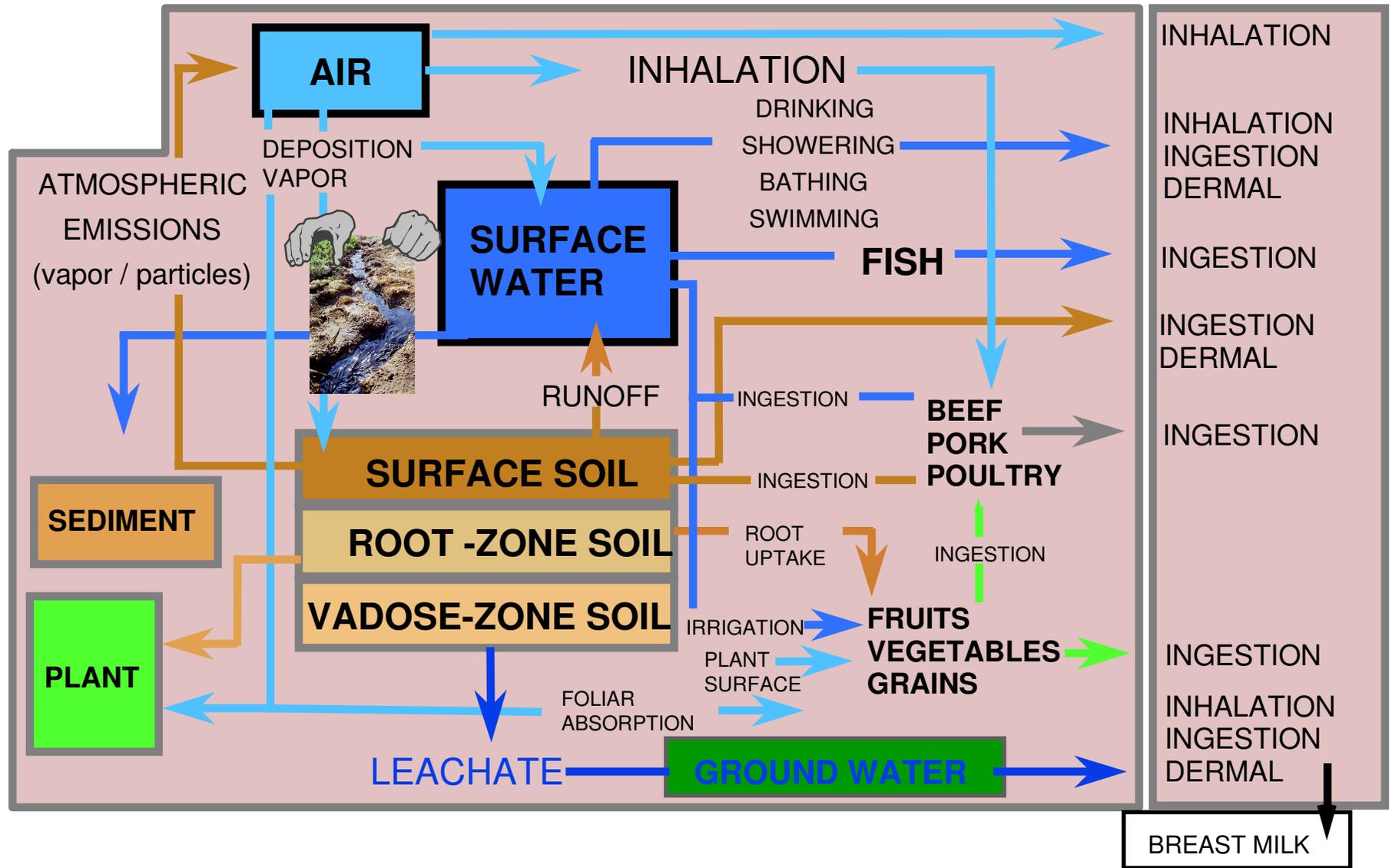


Target Risk/Hazards for CHHSLs

- Cancer Risk – One-in-one-million (10^{-6})
- Hazard Index - one

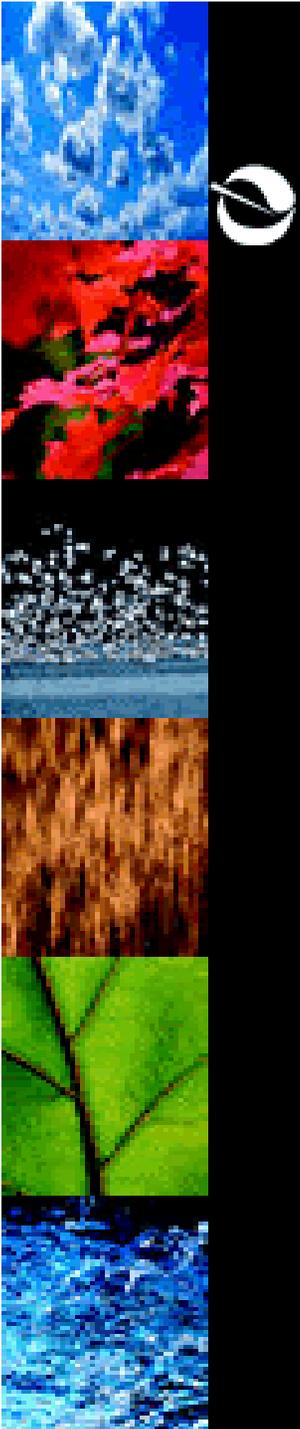


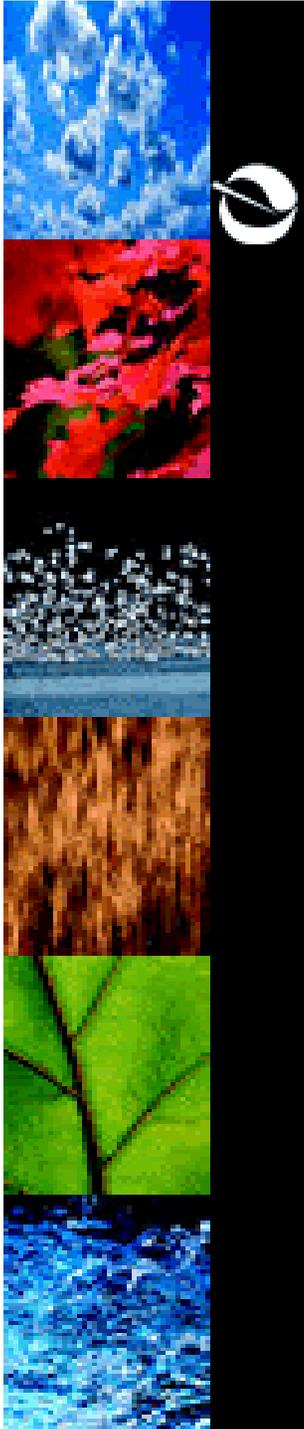
How do we think it all works?



Iterative Nature of Risk Assessment

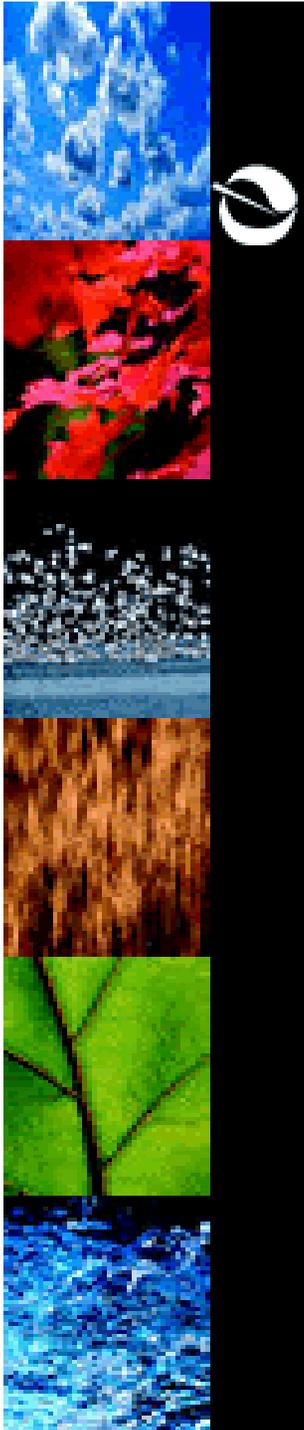
- Is there a problem?
 - Compare soil concentrations to CHHSLs (tier 1)
- What is the magnitude of the problem?
 - Do a baseline health risk assessment (tier 2 or 3)





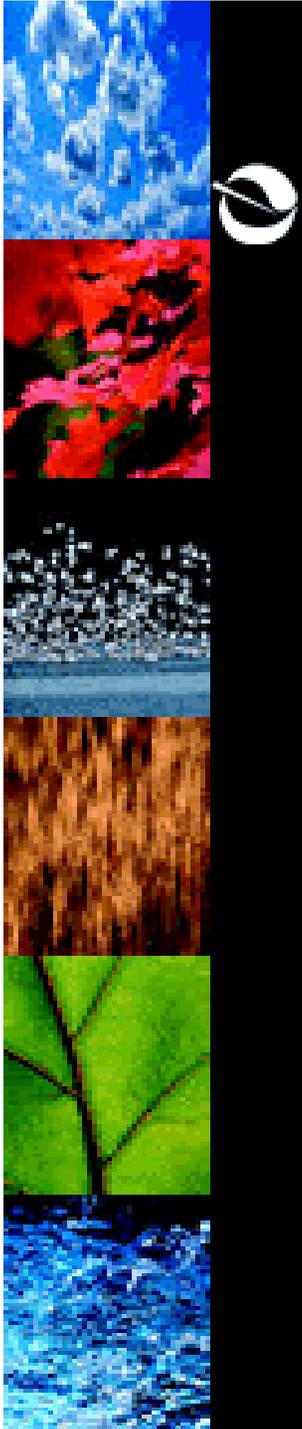
Screening Level Basics





**SPEED
LIMIT**
**(Please call
CHP)**



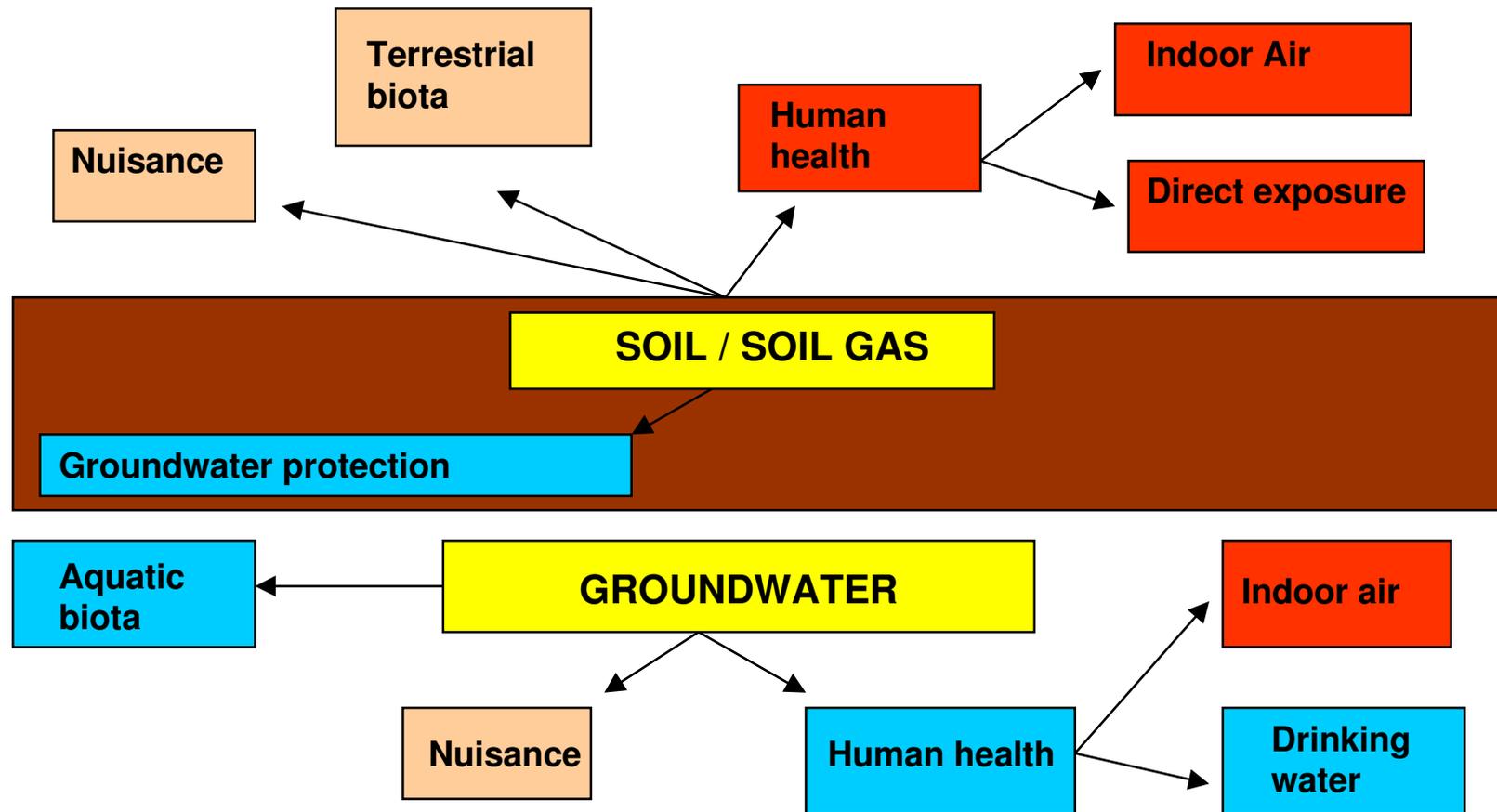


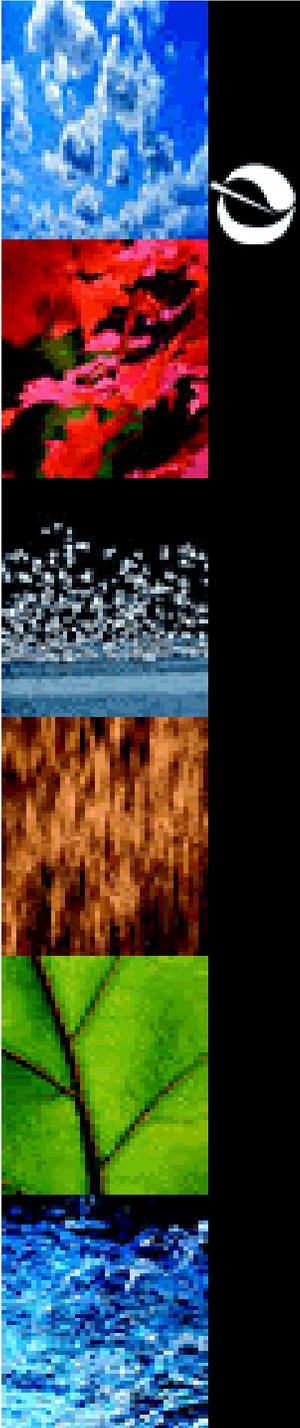
What are screening levels?

- A way to estimate environmental risk
- Use conservative values
- Address specific environmental concerns
- Use conventional risk endpoints
- Address most common contaminants



Environmental Concerns in Site Cleanup

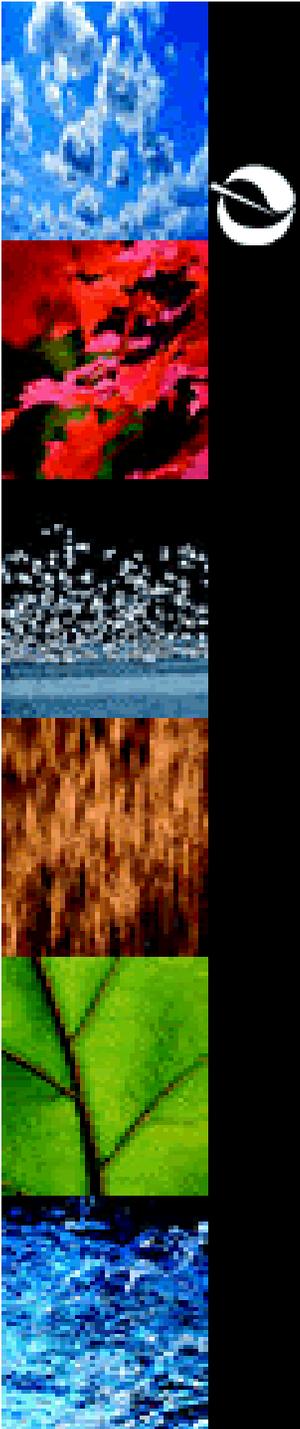




Why use screening levels?

- **Site-specific risk assessments not needed for simple sites**
- **Screening levels are cheap and quick**
- **Screening levels simplify site assessments**
- **Screening levels promote brownfield restoration**
- **Screening levels simplify mid-course corrections**

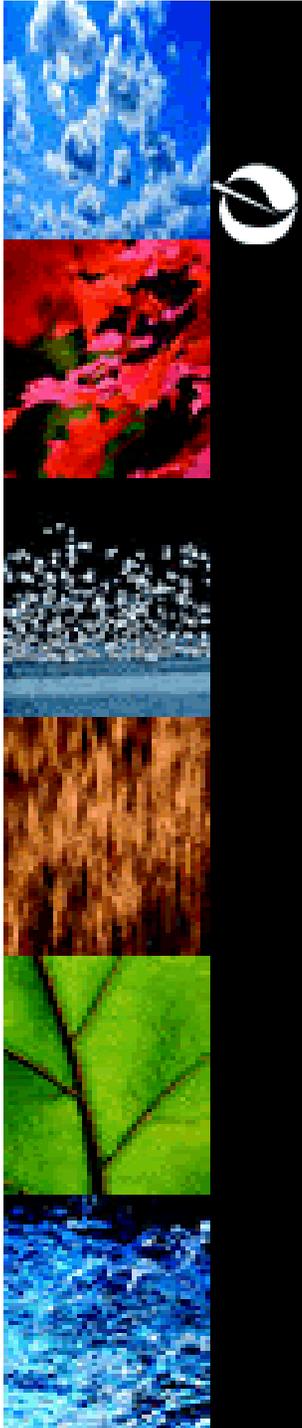




Risk assessment types

Tier 1	Screening levels based on conservative exposure assumptions
Tier 2	Adjust exposure assumptions based on site-specific data
Tier 3	Site-specific risk assessment



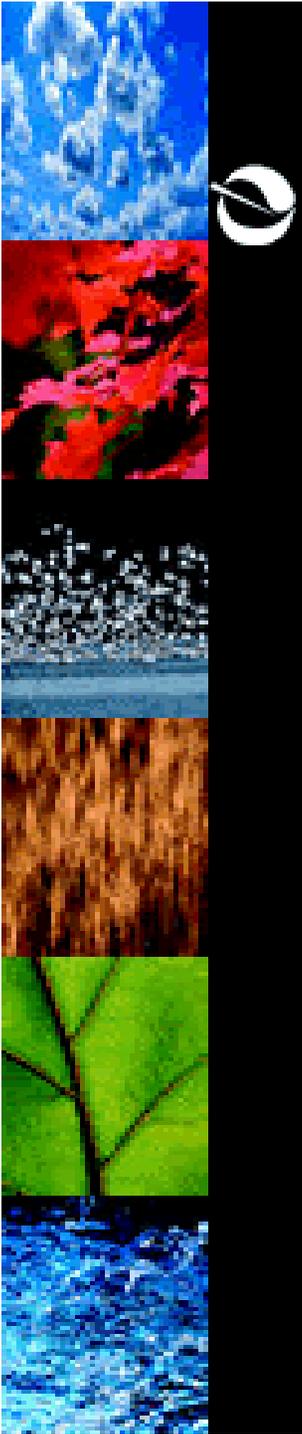


Compare screening levels and site-specific risk assessments

Similarities:

- Both are risk assessments
- Need good conceptual site model
- Rely on similar fate and transport models
- Use same risk endpoints



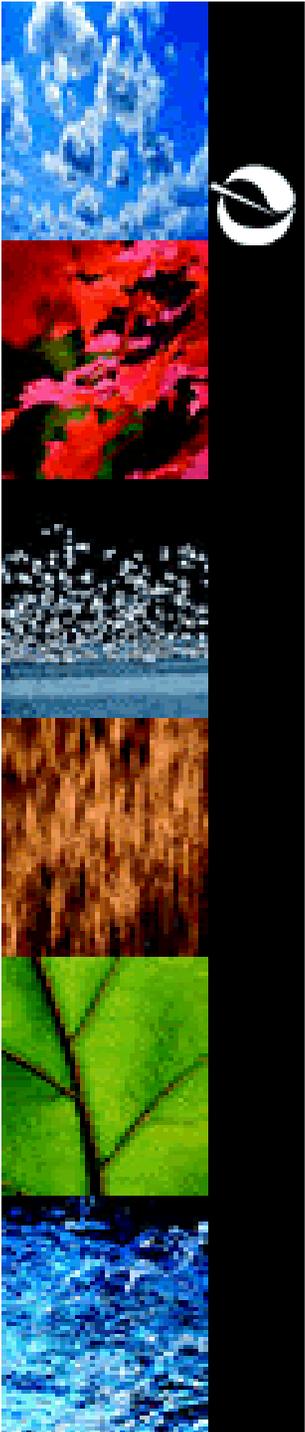


Compare screening levels and site-specific risk assessments

How screening levels are different:

- Require less site-specific information to identify risk-based objectives
- Cheaper and quicker
- Require less expertise to prepare and review
- Generally result in tougher cleanup standards and more cleanup work



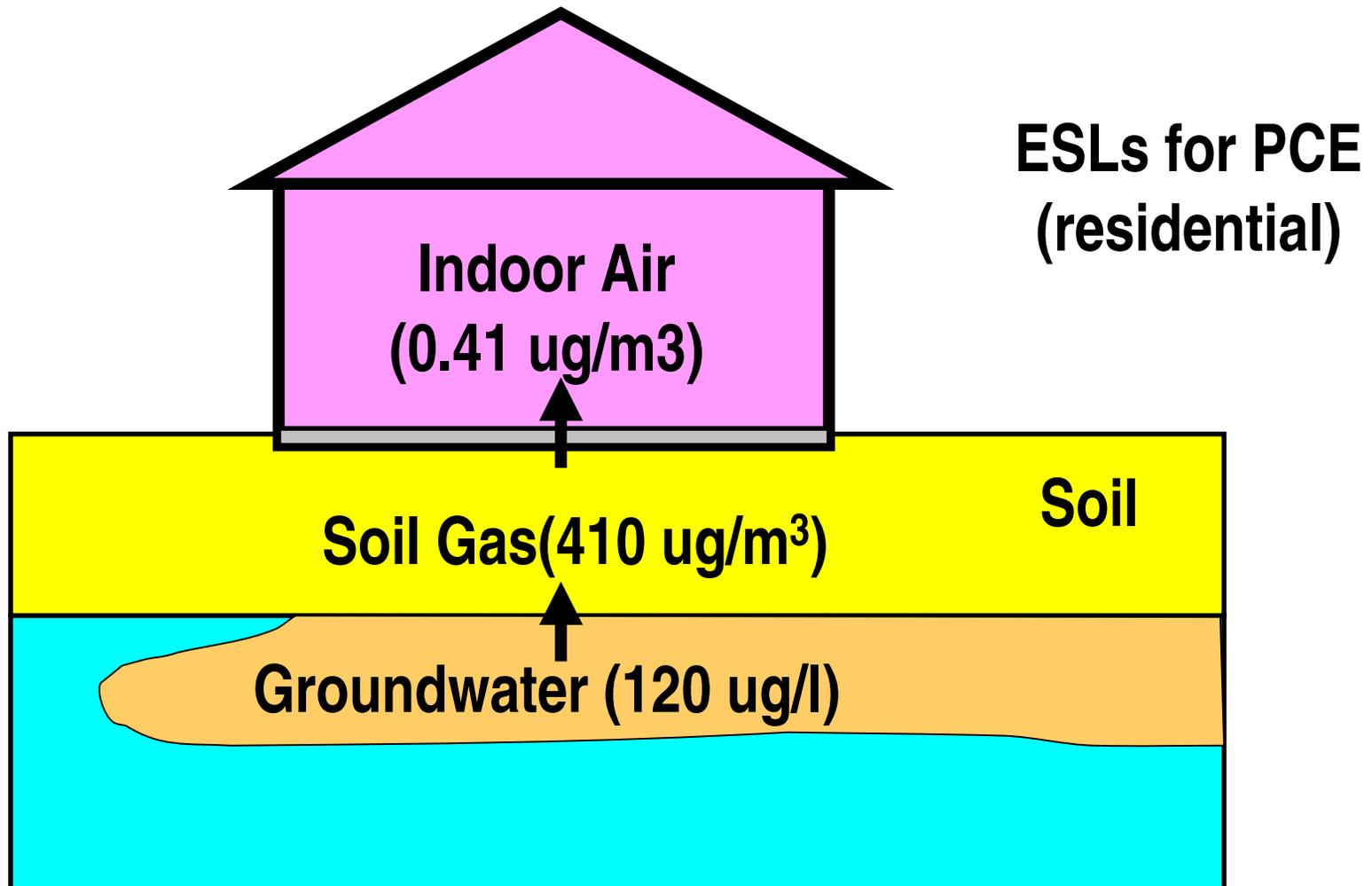


Screening levels versus cleanup standards

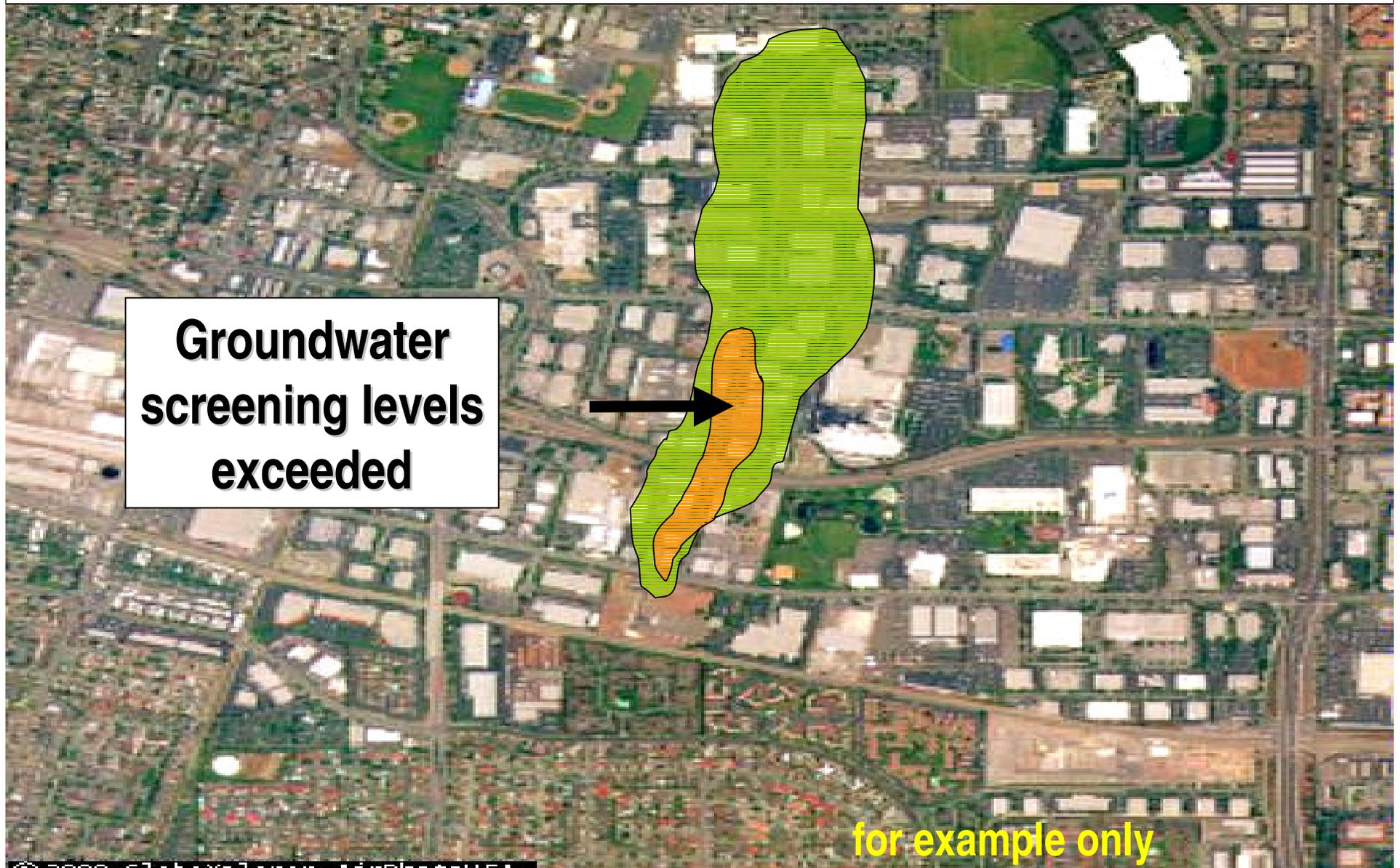
- **Use of screening levels is optional:**
 - *Applicant* may prefer to perform site-specific risk assessment (e.g. to reduce cleanup work)
 - *Regulator* may require site-specific risk assessment (e.g. complex site or some environmental concerns not addressed)
- **Screening levels can be used as cleanup standards ... *if* applicant and regulator both agree**



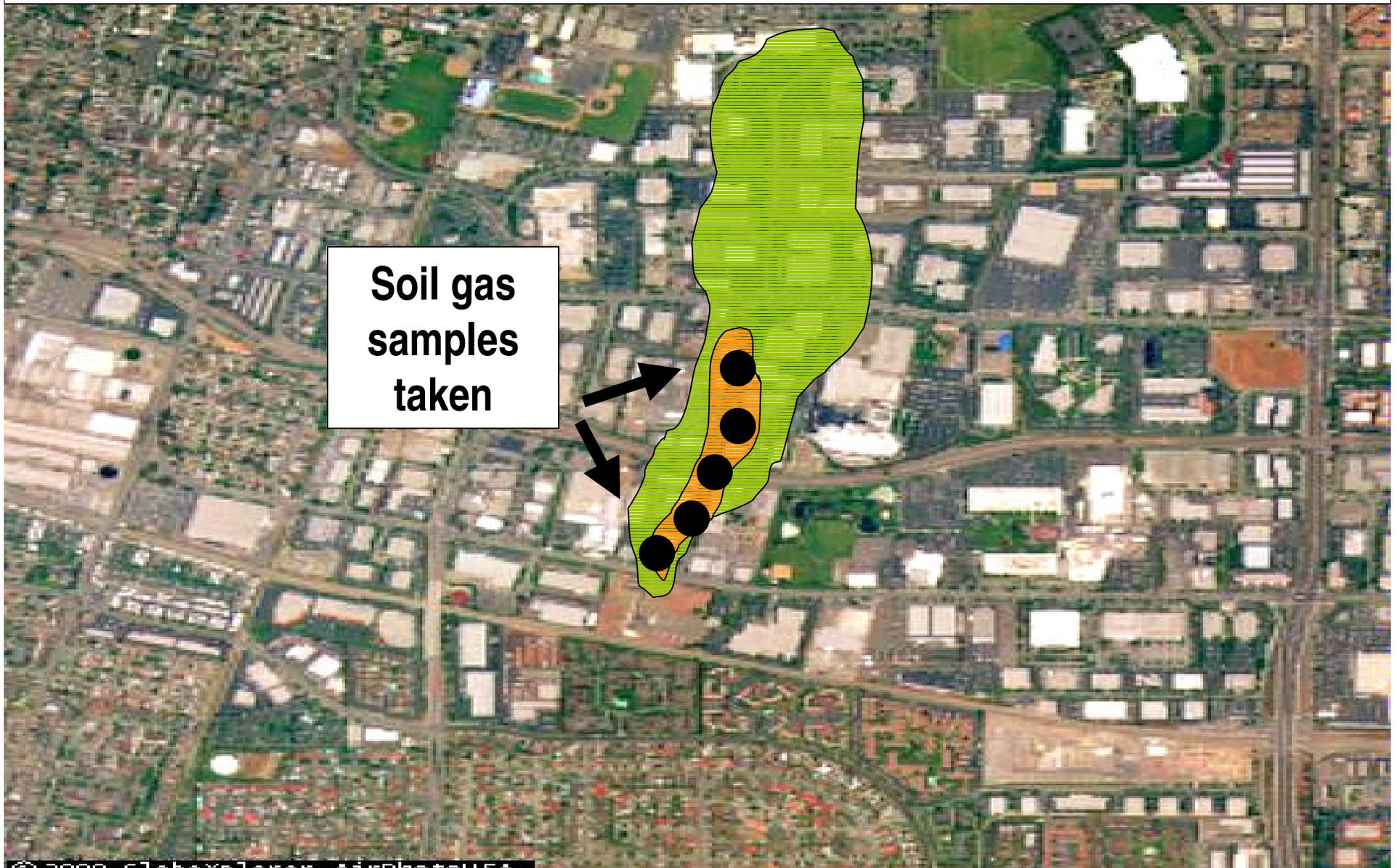
Case example #1 – vapor intrusion



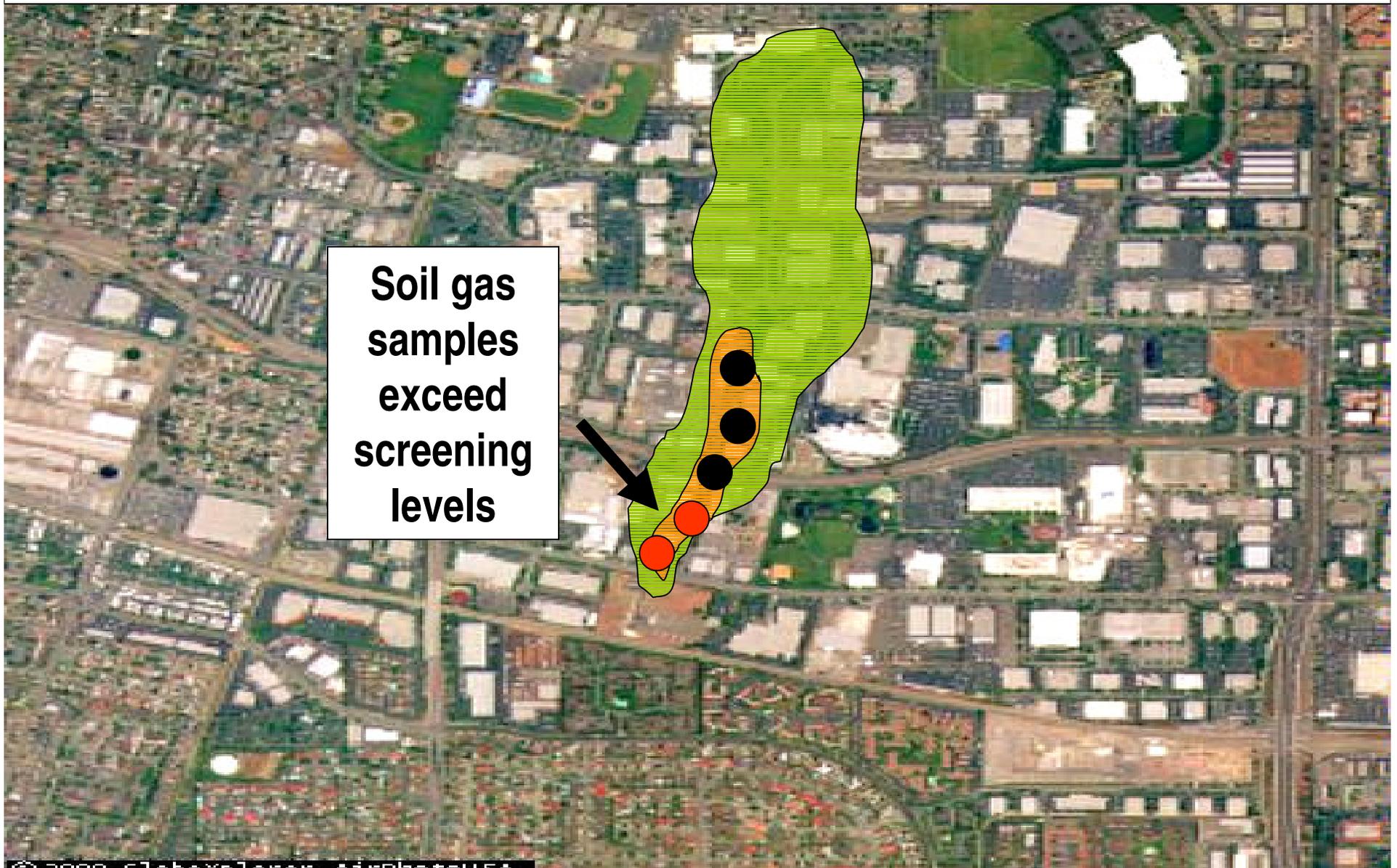
Step 1: Compare PCE in groundwater to screening levels



Step 2: Compare PCE in soil gas to screening levels



Step 2: Compare PCE in soil gas to screening levels

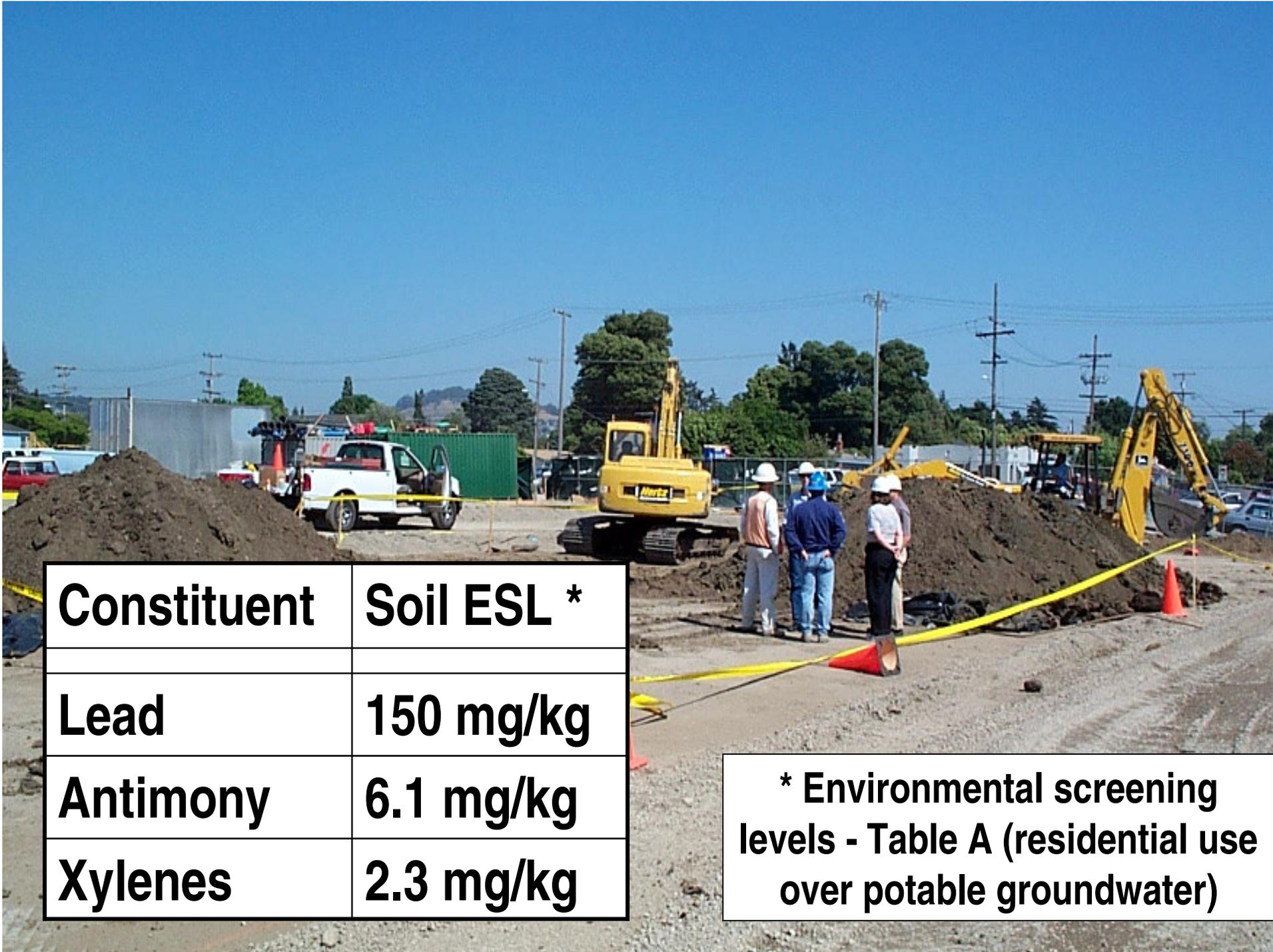


Step 3: Indoor air sampling



Case example #2 – unwelcome discovery during construction

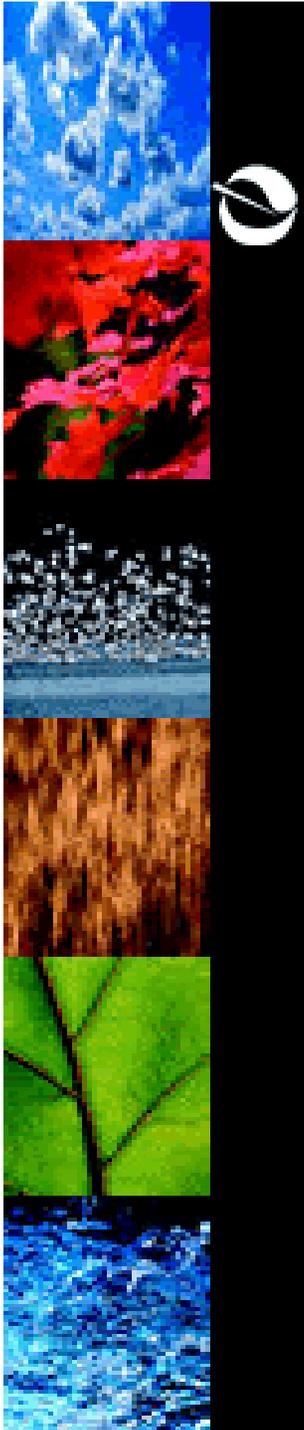




Constituent	Soil ESL *
Lead	150 mg/kg
Antimony	6.1 mg/kg
Xylenes	2.3 mg/kg

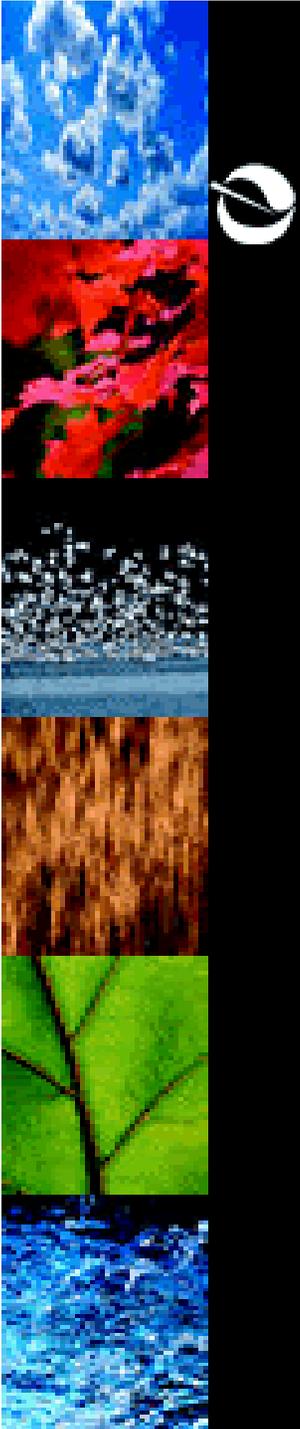
*** Environmental screening levels - Table A (residential use over potable groundwater)**





CHHSL Basics & Use



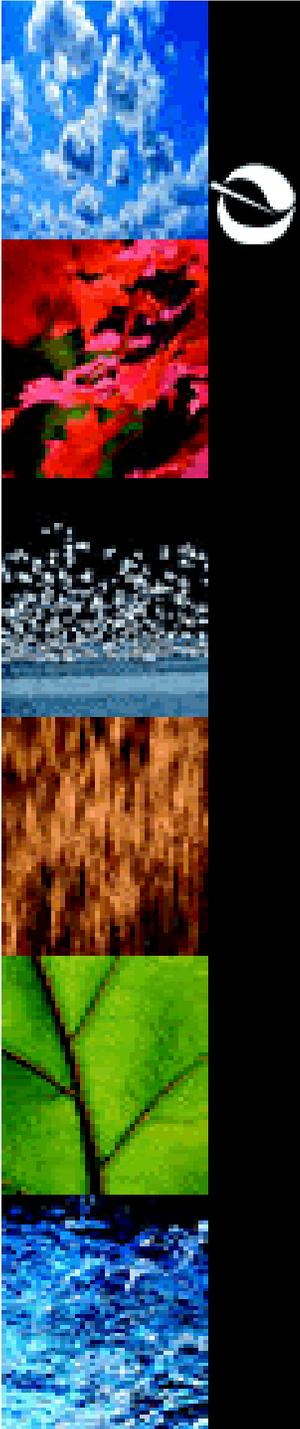


Purpose of Users Manual

- Provide a framework for the use of the CHHSLs
- Two sets of numbers:
 - Unrestricted land uses
 - Restricted, nonresidential land use

How they are used is possibly more important than that they exist!

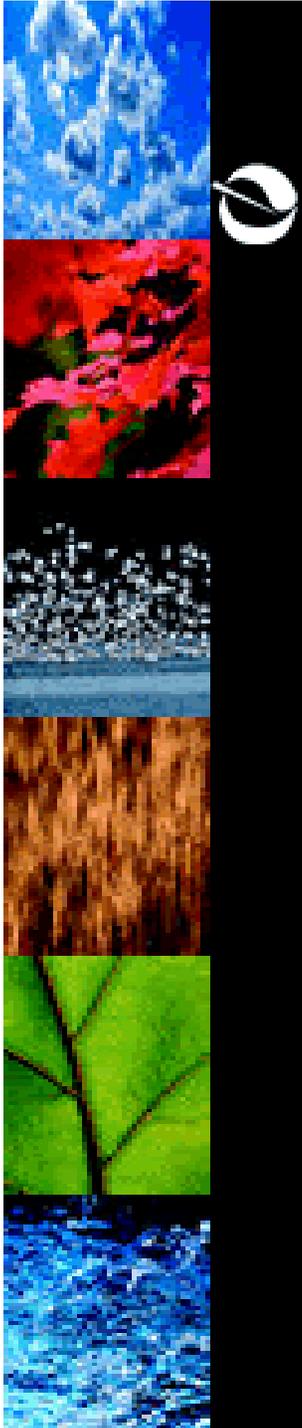




How many ways may CHHSLs be used?

- As described in the legislation.
- As a screening value – if agreed upon by all parties
- As a cleanup value – if agreed upon by all parties

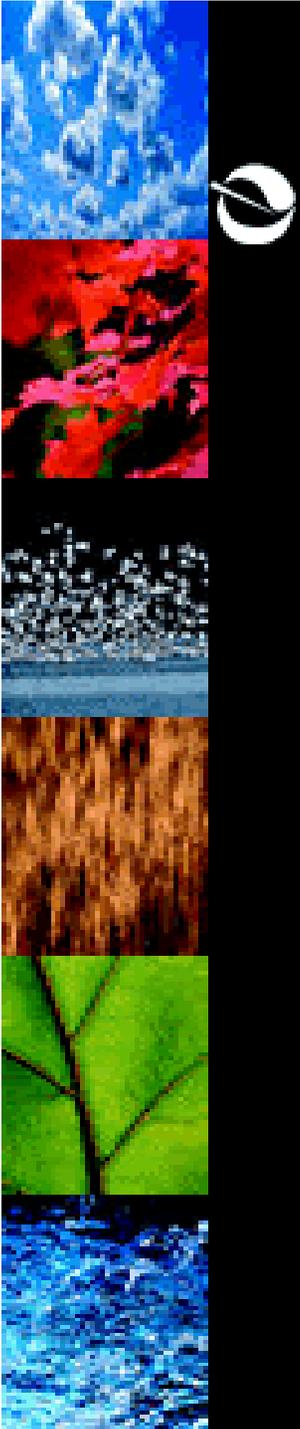




In what cases should CHHSLs NOT be used?

- Not as walk-away values
 - Ecological and leaching concerns must also be evaluated
- Not at school sites
 - The Schools Unit must be involved if your site is a potential school site
 - The Schools Unit is currently evaluating the CHHSLs

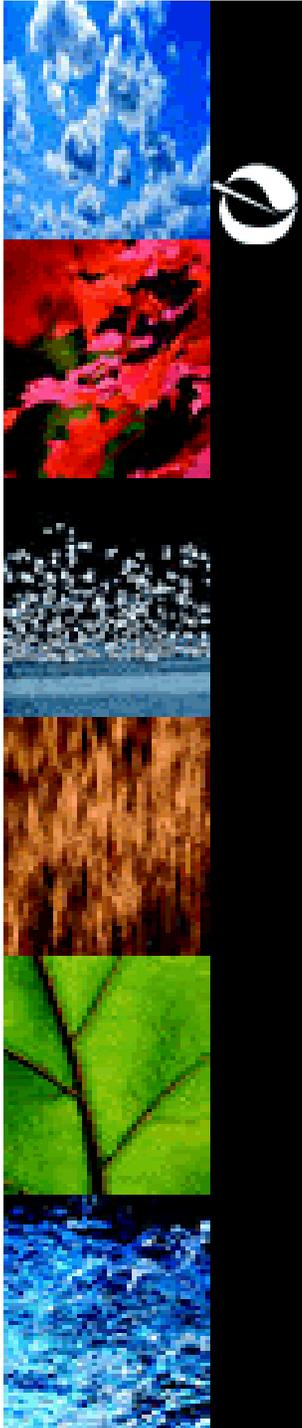




Using CHHSLs (steps 1 & 2)

- Step 1 – check for CHHSL updates and applicability
 - Are you using the most recent CHHSL updates?
- Step 2 – prepare a conceptual site model
 - Do the exposure pathways at your site match the exposure pathways used to develop the CHHSLs?
 - Have all potential environmental concerns been accounted for?

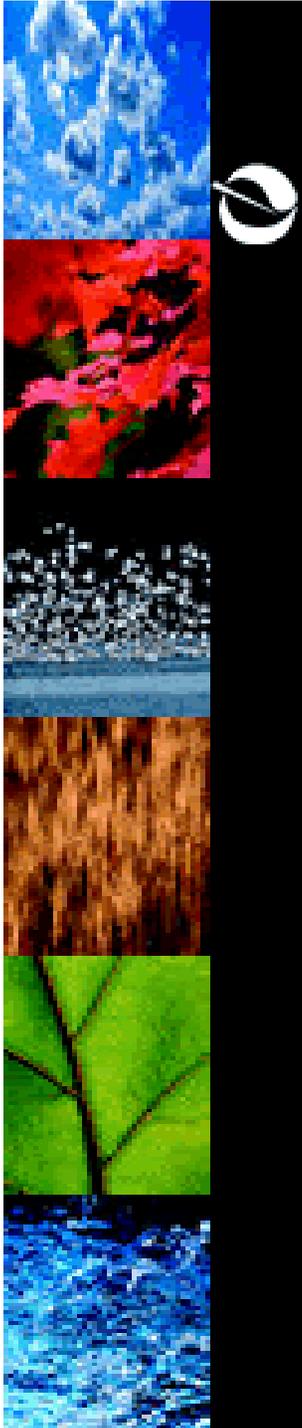




Exposure pathways included in the CHSL calculation

- For non-volatile chemicals (soil-bound):
 - Incidental soil ingestion
 - Dermal absorption
 - Inhalation of dusts in outdoor air
- For volatile chemicals:
 - Inhalation of indoor air contaminated by vapors intruding from the sub-surface
 - Direct exposure is not included for volatile chemicals

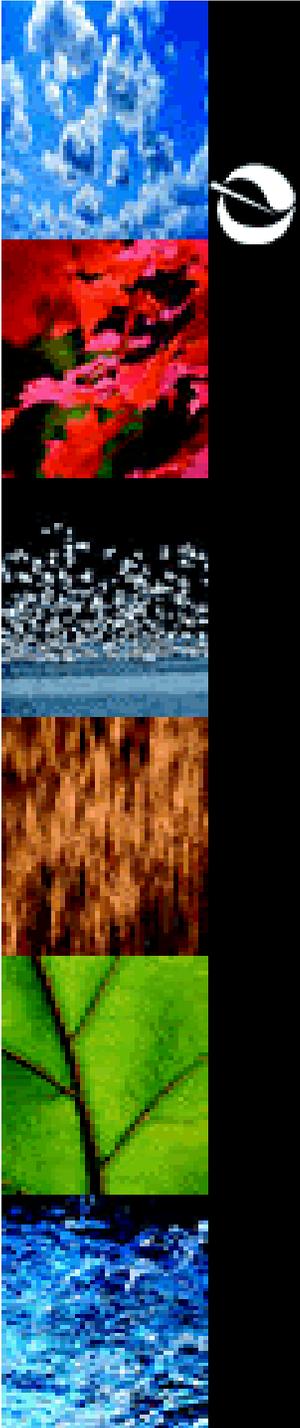




Using CHHSLs (steps 3 & 4)

- Step 3 – collect data - An iterative process
 - has a release occurred?
 - Have the hot spots been identified?
 - Has the site been adequately characterized?
- Step 4 – determine the desired land use
 - Will the CHHSLs be part of a PEA?
 - * If so, unrestricted (residential) land use must be assumed
 - Is a land use covenant a possible control?
 - * If so, commercial/industrial land use may be assumed

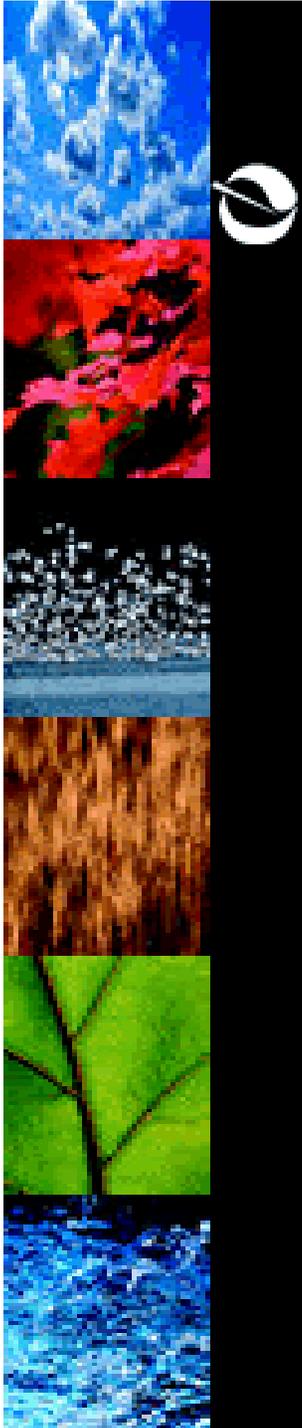




Using CHHSLs (steps 5 & 6)

- Step 5 – select CHHSLs
 - can local background concentrations be substituted for certain inorganic CHHSLs?
 - Is the method reporting limit above the CHHSL for certain chemicals?
- Step 6 – compare site data to CHHSLs
 - Will the CHHSLs be part of a PEA?
 - * If so, use the maximum detected concentration for each chemical.
 - Are there enough data to calculate an exposure point concentration, a 95% upper confidence limit (UCL)?
 - * If so, use appropriate guidance to estimate.

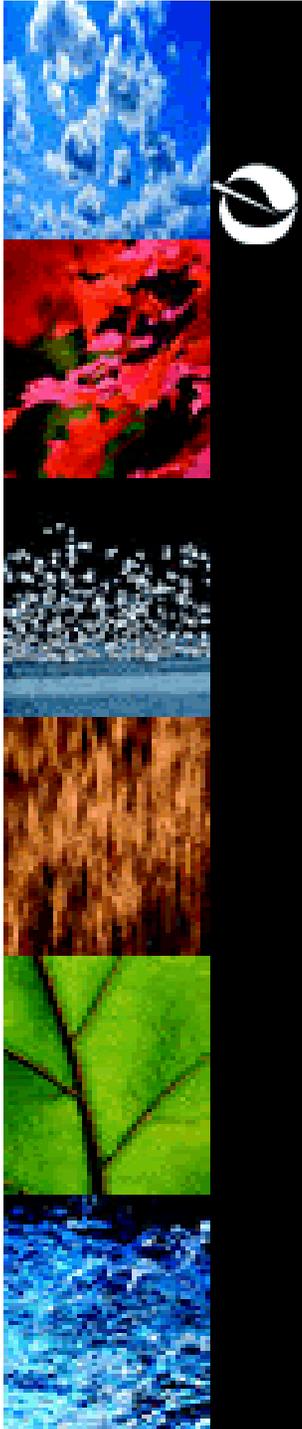




Using CHHSLs (step 6 cont'd)

- Step 6 continued – calculate cumulative risk/hazards if multiple chemicals are present
 - Two ways to do this:
 - ★ Follow the approach described in the guidance (section 2.8)
 - ★ Use the Excel calculator developed by the OEHHA and available on the Cal/EPA web site

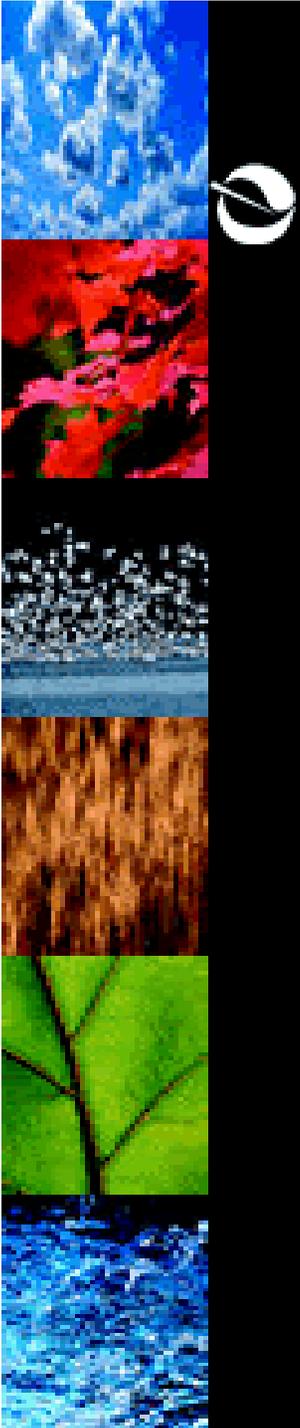




What about chemicals that do not have CHHSLs?

- Use the methods outlined in the PEA guidance manual for soil-bound chemicals.
- Use the Vapor Intrusion to indoor air guidance for volatile chemicals.
- Add the calculated risks/hazards to the cumulative risks/hazards calculated from the comparison of site concentrations to CHHSLs.

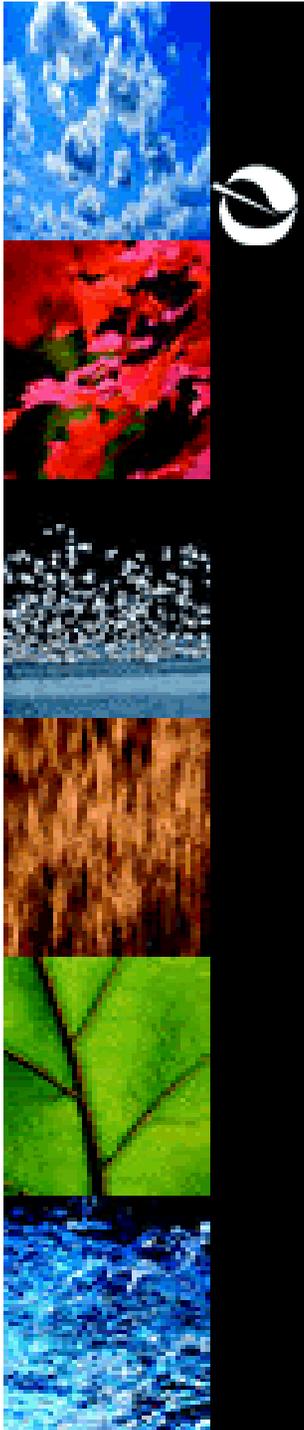




Using CHHSLs (steps 7 & 8)

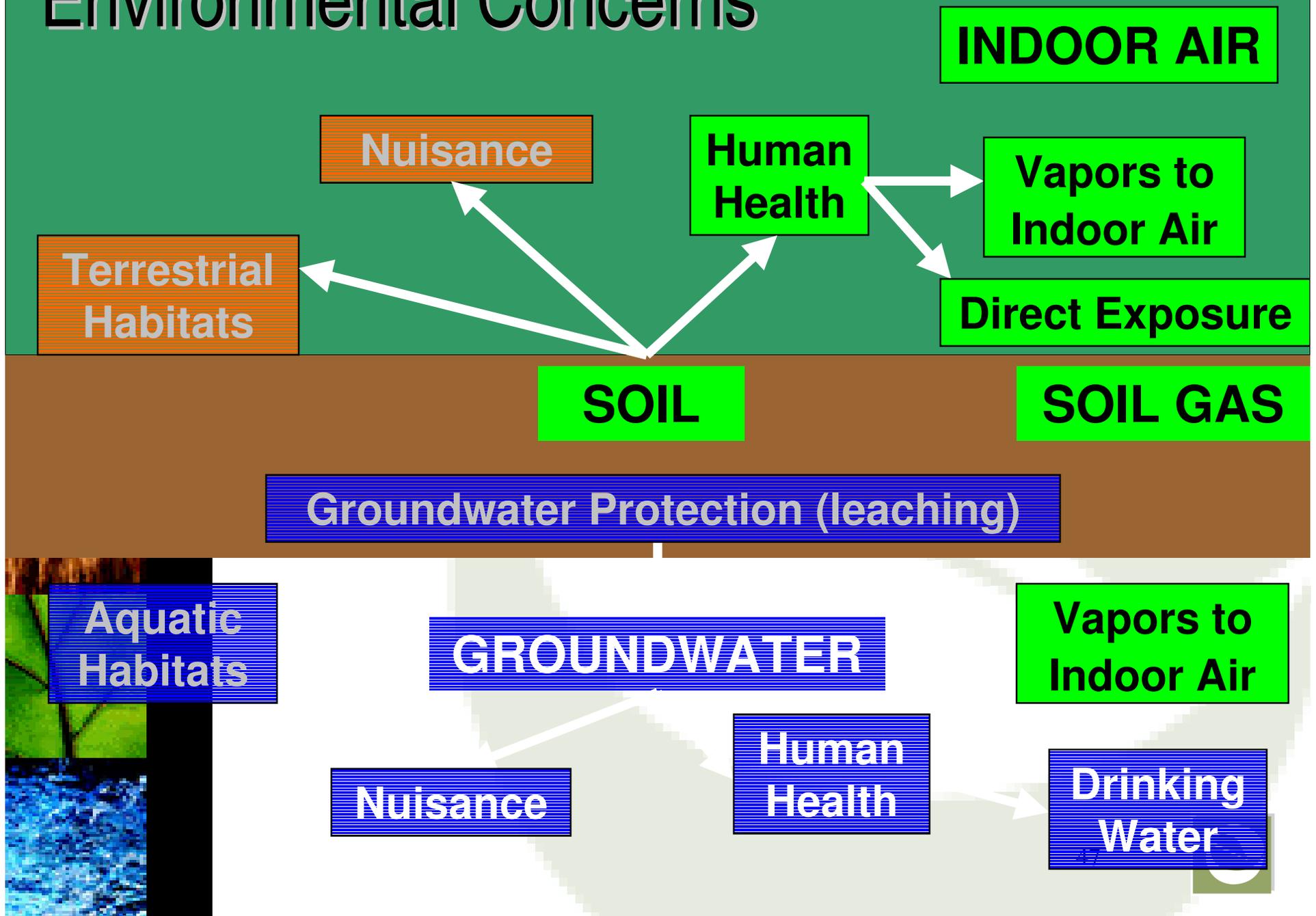
- Step 7 – evaluate the need for additional investigation to address human health concerns
- Step 8 – evaluate other potential environmental concerns
 - Are there ecological concerns?
 - Are there leaching concerns?

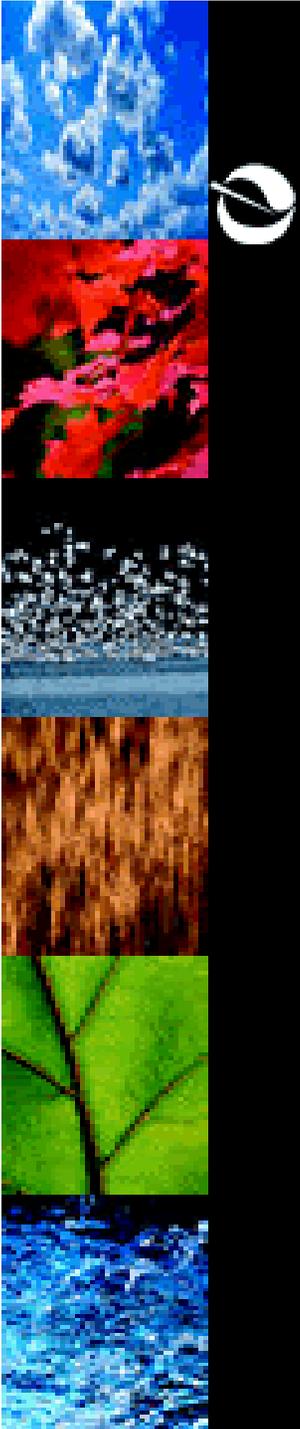




Limitations of the use of CHHSLs

Environmental Concerns

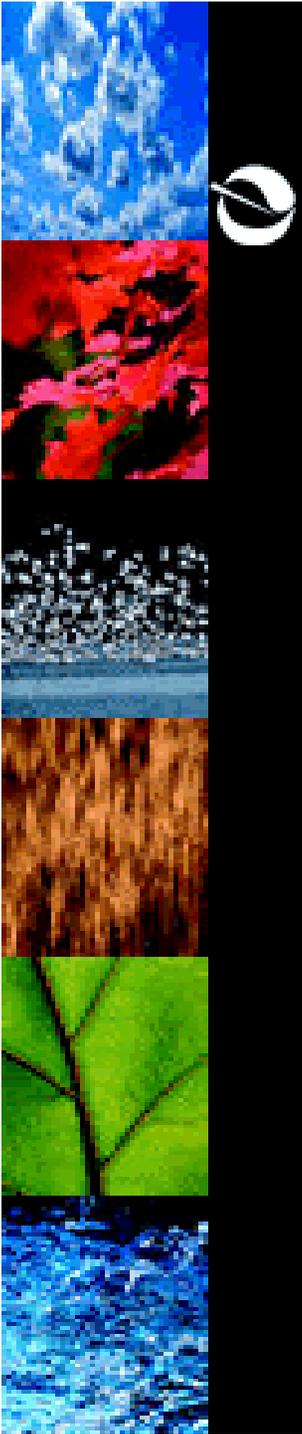




Limitations of CHSLs

- If contaminated soil is source for potential ground water contamination
- If excluded exposure pathways are complete
 - Food, breast milk ingestion
- If ecological receptors are the most sensitive receptors



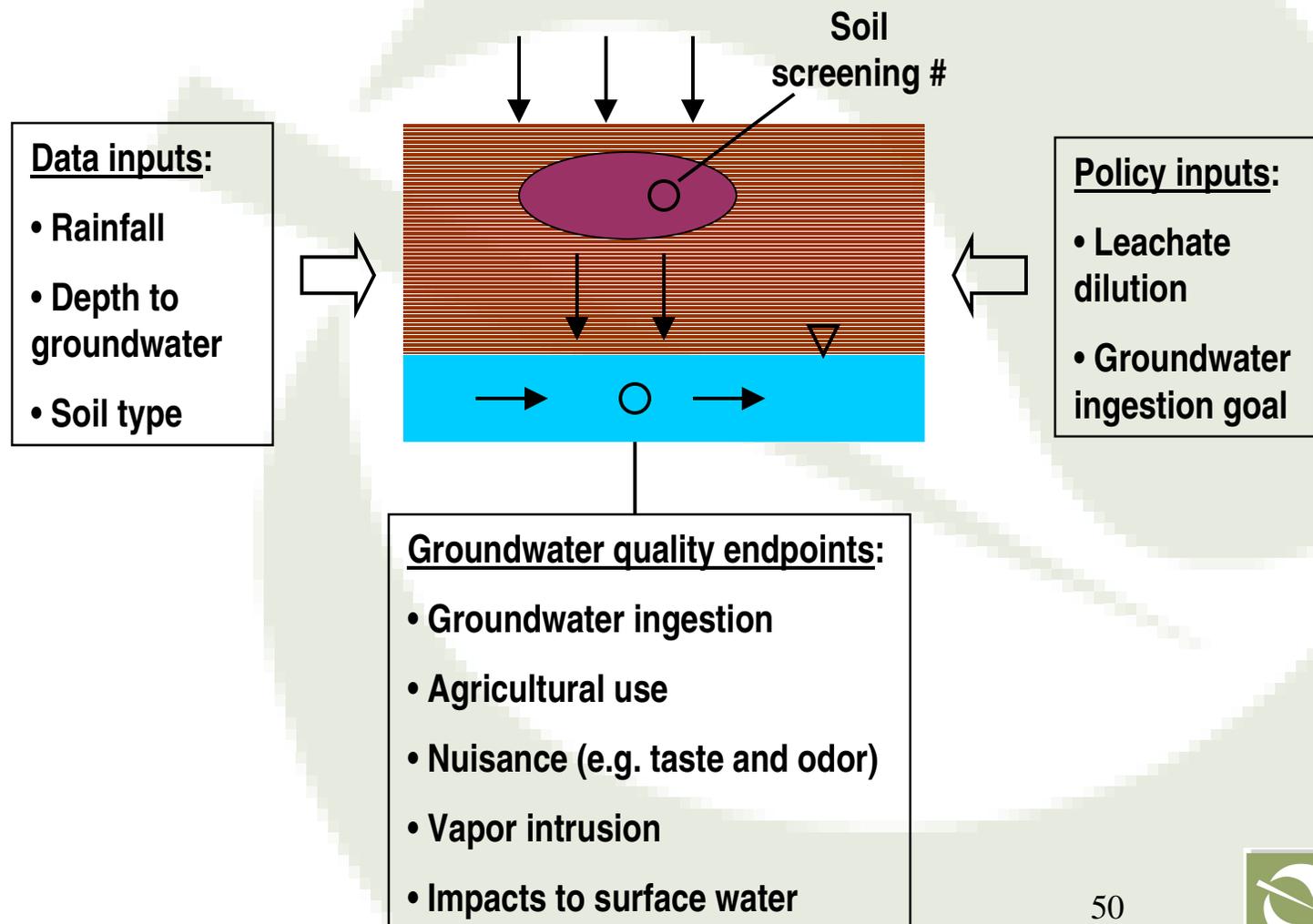


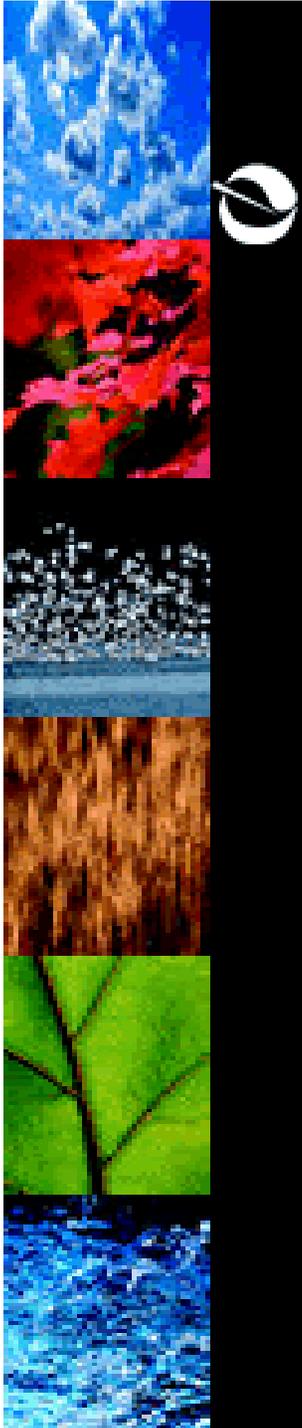
Next Steps

- **Revise CHHSLs as appropriate:**
 - Expand environmental concerns addressed
 - New chemicals
 - Update numbers
- **Water Board initiative – soil and groundwater screening levels to protect water quality**



Screening level approach to protect water quality - Draft





Relationship to Other Values

- U.S.EPA Preliminary Remedial Goals (PRGs)(Region IX, other Regions)
- U.S.EPA Soil Screening Guidance
- San Francisco Regional Board Environmental Screening Levels
- City of Oakland Screening Levels (Los Angeles and other cities?)
- Hazardous Waste Levels
- TSCA – PCBs
- OSHA Permissible Exposure Limits

